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Assembly and testing of a QWR for the new ISIS MEBT

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The quarter wave resonator (QWR, a.k.a. $\lambda/4$ resonator) for the new ISIS MEBT is a bunching cavity that longitudinally compresses the H- beam into smaller bunches. It has two gaps with a distance of $\beta\lambda/2$ between mid-gaps, and works in π mode at the resonant frequency of 202.5 MHz, with a phase angle of -90 degrees, and a maximum voltage per gap (E0L) of 55 kV. The detailed RF and thermal design was developed, followed by the manufacturing of a prototype, all being presented elsewhere. Several mechanical issues were noticed with the RF finger strips and tuners during the assembly of the prototype cavity. The manual tuner (to account for the manufacturing tolerances and the vacuum load) was machined to the final dimension to achieve the desired resonant frequency, according to the Vector Network Analyser (VNA) measurements. The measured quality factor was found to be much lower than expected, which required a redesign of some of the RF seals. The cavity was powered and conditioned in a relatively short time up to a nominal power, but severe multipacting was observed, initially only at low power, but later also at medium power levels, which required a creative approach to be fixed without a major cavity redesign.

Footnotes

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Word

Region represented

Europe

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